

GIBBON RIVER BRIDGE II
Yellowstone Roads and Bridges
Spanning Gibbon River on Grand Loop Road
Yellowstone National Park
Park County
Wyoming

HAER No. WY-30

HAER
WYO
15-YELNAP,
6-

BLACK & WHITE PHOTOGRAPHS
WRITTEN HISTORICAL & DESCRIPTIVE DATA

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HISTORIC AMERICAN ENGINEERING RECORD

GIBBON RIVER BRIDGE II

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Location: Spanning Gibbon River on Grand Loop Road, 6.1 miles south of Norris Junction, Yellowstone National Park, Park County, Wyoming
UTM: Norris Junction, WY, Quad. 12/520320/4945870

Date of Construction: 1938

Owner: Yellowstone National Park, National Park Service

Use: Vehicular bridge

Designer: Architectural plans by W.G. Carnes, National Park Service
General plans and specifications by Bureau of Public Roads

Builder: Strong and Grant, Springville, Utah

Significance: Gibbon River Bridge II typifies the early design philosophy of the National Park Service, which was to use indigenous materials to harmonize man-made features with their natural surroundings. This philosophy is embodied in many of the park's Rustic Style buildings and structures.

Project Information: Documentation of Gibbon River Bridge II is part of the Yellowstone Roads and Bridges Recording Project, conducted during the summer of 1989 by the Historic American Engineering Record, a division of the National Park Service, under the co-sponsorship of Yellowstone National Park, the NPS Roads and Bridges Program, and the NPS Rocky Mountain Regional Office, Denver. Historical research and written narrative by Mary Shivers Culpin, Historian, NPS Rocky Mountain Regional Office. Engineering description by Steven M. Varner, Virginia Polytechnic Institute. Edited and transmitted by Lola Bennett, HAER Historian, 1993.

HISTORY OF GRAND LOOP ROAD

(See HAER WY-24, Yellowstone Roads and Bridges.)

DESIGN AND CONSTRUCTION OF GIBBON RIVER BRIDGE II

Gibbon River Bridge II, completed in 1938, carries Grand Loop Road over Gibbon River, 6.1 miles south of Norris Junction. The location survey for the bridge was one of the first projects of the Bureau of Public Roads after they assumed the responsibility for road and bridge construction in Yellowstone National Park in 1926. The 1927 survey between Norris Junction and Madison Junction successfully designed the new road alignment to fit the location of the existing Army-built bridges with major improvements to the bridge approaches.

Plans for Gibbon River Bridge II were completed by the Regional Office of the Bureau of Public Roads, with the National Park Service Division of Plans and Design contributing the architectural designs. Strong & Grant of Springville, Utah, were awarded the contract on September 25, 1936. Gibbon River has a maximum discharge of 809 cfs .6 miles downstream from Canyon Creek which is near the bridge.¹

DESCRIPTION

Gibbon River Bridge II is a concrete deck girder structure with encased steel beams on the outside and masonry piers and abutments. The bridge is of three spans with a maximum span length of 39'-8". This span length is measured from center of support to center of support. The flanking spans are 31'-8". The structure length is 104' from end of backwall to end of backwall. The deck width is 30'-7" while the bridge roadway from curb to curb is 26'-0".²

The design load was 15 tons and the grade of the bridge is 0.47 percent going uphill from south to north. The slab is 8" thick and is reinforced with longitudinal and transverse bars. The transverse bars are $\frac{5}{8}$ "-diameter at 5 $\frac{1}{2}$ -inch centers, while the longitudinal bars are $\frac{1}{2}$ "-diameter. There are fifteen simple steel I-beam girders supporting the deck, five to each span. The outer six girders are encased in concrete with the bottom flange exposed and the interior web partly exposed on the inside. In the flanking spans the outer girders are 24-inch WF at 74 pounds per foot while the six inner girders are 24-inch WF at 87 pounds per foot. In the middle span the outer girders are 24-inch WF at 120 pounds per foot. The girders are transversely braced with I-beam members and channels. These braces are staggered between the girders over the abutments and piers and in the middle of the span. Over the abutments and piers they follow the orientation of the abutments and piers while in the middle of the span they are perpendicular to the girders. The transverse members in the middle of the span are 12-inch channels at 20.7 pounds per foot while over the abutments and piers they are 16-inch WF at 36 pounds per foot. The girders rest on bearing plates on the abutments and piers.³

Gibbon River Bridge's piers are on a skew and the bridge curves 8 degrees 30 minutes to the left as one looks north. This curve creates torsion which decreases the stress in the girders towards the center of curvature and increases the stress correspondingly on the girders away from the center of curvature. This difference is not large for multiple girder systems like that found in this bridge. The torsion created translates into horizontal and vertical forces which must be transferred to the girders near the center of curvature. To achieve this Gibbon Bridge has nearly full-depth cross frames.

The plans called for all exposed concrete to be stained with two coats and the steel rail to be painted with two coats of green paint. The concrete was not stained because the desired color could not be obtained. Since the concrete was not stained, a third coat of white paint was put on

the steel rail to better blend with the unstained concrete.⁴

The guardrail is made of steel posts 2"x5" set in concrete on 6'-2" centers. The posts rise 2'-3" from the curb. The horizontal members of the guard rail are 4-inch channels weighing 6.25 pounds per foot framing into the bar posts near the top and bottom. One-inch square vertical bars at 7½-inch to 8½-inch centers run between the channels which cup downwards.⁵

The abutments and piers are masonry and have spread footings which rest on firm material. This material is very tightly packed gravel. They rise about 6' from the river bed to the girders. The abutments and piers batter 1:12 on the sides running transverse to the bridge and 2:12 on the sides running longitudinally to the bridge. The abutments are U-shaped with wing walls between 26' and 19' long slightly flared.⁶

The reinforcing steel for this bridge was purchased from the Provo Foundry and Machine Company in Provo, Utah, and hauled to the bridge by the contractor. Coarse and fine aggregate was taken from near the site. The structural steel came from the American Bridge Company. The cement came from the Idaho Portland Cement Company of Inkom, Idaho.

Completed in July 1938, the bridge cost \$26,604.10.⁷

ENDNOTES

- 1.U.S. Geological Survey, Water Resources Data Montana Water Year 1986, Volume I, Hudson Bay Basin, Missouri River Basin.
- 2.Gibbon River Bridge, Station 400+70, Plans 2-5/6, January 1936, Bureau of Public Roads, U.S. Department of Agriculture.
- 3.Gibbon River Bridge, Station 400+70, Plans.
- 4.E.O. Anderson, "Final Construction Report (1936-38) on Grand Loop National Park Highway 1-B1 Bridges," 1 March 1939, Bureau of Public Roads, U.S. Department of Agriculture.
- 5.Gibbon River Bridge, Station 400+70, Plans.
- 6.Ibid.
- 7.Anderson, "Final Construction Report (1936-38) on Grand Loop National Park Highway 1-B1 Bridges."